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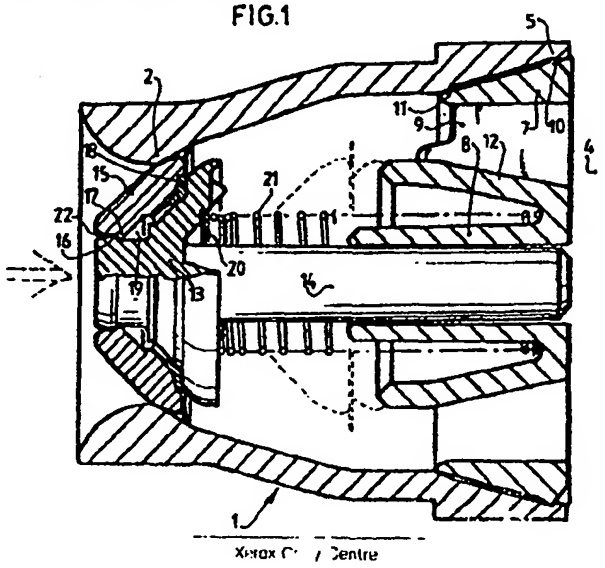
(54) One-way-valve.

(57) The invention concerns a one-way-valve, which has been provided with a chamber (19) connected with the supply side (3) of the valve by a throttle channel (22). This chamber can be provided in the valve body or in the valve seat (2). When the valve body hits the valve seat, the water pressure at the user's side of the valve empties the chamber through the channel, slowly decelerating the movement of the valve body. This avoids the building up of harmful shock waves in the water supply network.

FIG.1



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One-way-valve

The present invention relates to a one-way-valve comprising a valve seat fixed in a tubular body and a movable valve body.

Such one-way-valves are generally known.

Such known one-way-valves are often used in connections of water users of the water distribution network, wherein such a valve avoids that water from the user flows back towards the network in the case of disappearance of the pressure in the water network. Further such valves find application in water using apparatus, for instance water heaters.

When, in the case of such a known valve, the water pressure on the supply side disappears, the valve body will move towards the supply side as caused by the spring present in the valve and the back flowing water until it suddenly hits the valve seat, causing the valve body to be decelerated over a very short path. This causes shock waves at the user's side of the valve, which firstly produce a nuising sounc and secondly load the junctions between tube parts and connectors to a high extend, so that the danger exists that as an influence of these shock waves leaks will develop.

The aim of the present invention is to provide such a one-way-valve, wherein the development of such damaging shock waves is avoided as far as possible.

This aim s reached in that the valve comprises a chamber connected with the supply side of the valve through at least one throttle channel, of which chamber the volume is reduced when the valve moves over at least a part of the path towards the valve seat.

By the application of such a chamber, the valve is decelerated so slowly during the hit of the valve seat that the fluid present in the chamber is pressed out of the chamber by the valve and the valve, as a consequence thereof is decelerated so slowly that a certain breaking path and a certain deceleration time develops, so that the deceleration of the valve reaches considerable lower values than before. As a consequence thereof the amplitude of the shock wave developed to the user side is much smaller than before. Thus the harmful effects thereof are nearly completely eliminated.

Subsequently, the present invention will be elucidated with the help of the accompanying drawings, wherein the following is depicted:

fig. 1: a schematic view executed substantially as a cross section of a first embodiment of the valve according to the present invention at the moment that the valve hits the valve seat;

fig. 2: a schematic view of the valve of fig. 1 during the deceleration of the valve; and

fig. 3: a schematic view, partly broken away, of a second embodiment of the valve according to the present invention.

The embodiment of the one-way-valve according to the present invention depicted in fig. 1 comprises a substantially tubular valve housing 1, generally produced of plastic, into which an inner rim 2 has been provided, acting as valve seat. This rim has been provided at the supply side 3 of the valve housing 1, while at the user's side 4 of the house a ring-shaped notch 5 has been provided, into which a guide body 6 has been provided. The guide body 6 comprises a ring 7 and a cilinder 8 mutually connected by three spokes 9. The ring 7 comprises at its outer side a rim 10 fitting into the ring-shaped notch 5 of the valve housing 1, while the ring 7 comprises a ring-shaped centre plane 11, resting against the inner wall of the valve housing 1, so that the whole guide body 6 can easily be located through the ring-shaped notch 5 and the rim 10 by the snap lock, in which the centre planes 11 provide a good centring of the guide body 6. Around the cilinder 8 a spring housing 12 has been provided.

The movable part of the valve according to the present invention comprises a valve body 13, that is composed of a stem 14 extending through the cilinder 8 and being guided by said cilinder. At the head side of the valve body 13, a ring-shaped member. 15 has been provided that is adjacent against the valve seat in the closed condition of the valve. The part of the ring-shaped element 15, that is adjacent to the valve seat 2 as beveled, so that here as well a good centre action is obtained. For localising the ring-shaped element 15 unto the valve body 13, the valve body 13 comprises a rim 16 and the ring-shaped element 15 comprises a rim 17 extending inwardly. These two rims together construct a snap lock so that the ring-shaped element 15 can be fixed easily unto the valve body 13. This rim lock transmits the ring-shaped element 15 with a certain freedom of movement in the axial direction. Between the ring-shaped element 15 and the part of the valve body 13 extending perpendicular to the axial direction, a ring 18 of a resilient materiaal, for instance rubber, is provided and such that a substantial ring-shaped chamber 19 is embraced by the ring-shaped element 15 and the valve body 13. As a consequence of the axial movability of the ring-shaped element 15 relative to the valve body 13 in the chamber 19, the

variable.

By means of a channel, which is also ring-shaped, and which stretches between the rim 17 and the valve body, and between the rim 16 and the ring-shaped element, the chamber 19 is connected with the supply side of the valve.

At the back side of the valve body 13, a ring 20 has been provided, against which a helical spring 21 is provided. This helical spring 21 is at its other side locked between the spring housing 1 and the cilinder 8. The valve body 13 is urged towards the valve seat by means of the pressure of the helical spring 21.

Subsequently the operation of the valve according to the present invention will be described. During normal use water is supplied from the supply side 3, so that the valve body 13, including the ring-shaped element 15, is urged by the water pressure against the pressure of the spring 21 towards the user's side and a ring-shaped slit develops between the ring-shaped element 15 and the valve seat 2 through which the water can flow. Then the water flows through the valve housing 1 between the spokes 9 and it leaves at the user's side.

When through any reason the water pressure at the supply side 3 disappears, the water pressure at the user's side 4 will urge the valve body 13 and also the ring-shaped element 15 towards the valve seat 2 with a considerable force. Further the pressure of the spring 21 enhances this effect. The movement caused thereby will continue until the ring-shaped element 15 has been moved against the valve seat 2. The slit therebetween is then sealed completely so that the full pressure of the water at the user's side 4 is directed towards the valve body 13.

In relation with the freedom of movement between the ring-shaped element 15 and the valve body 13, the possibility exists that the valve body 14 will move further towards the supply side despite the fact that the ring 15 is working. This will involve the reduction of the volume of the chamber 19 through which the liquid being present in the chamber 19 will flow away through the channel 22. In relation with the narrowness of the channel 22, this outflow will involve some resistance. As a consequence thereof the movement of the valve body 13 is decelerated which process stretches during some period of time. The deceleration of the valve is much smaller than before, so that the pressurethrust is much smaller. Further in fig. 2 it is shown how the valve housing 1 has been locked up in a water tube 23. This comprises a rim 24, through which the rim 25 of the valve housing 21 is being fixated. Further a ring 26 is shown, which locks up the valve housing.

Fig. 3 shows a second embodiment of the valve according to the present invention. In this embodiment the elements coïnciding with the elements according to the first embodiment have been indicated with the same indication numbers.

In this embodiment, no ring-shaped element has been provided on the valve to form a chamber in the valve, but the chamber has been provided within the valve seat. By means of a number of ring-shaped rims, a ring-shaped body 27 has been provided unto the valve body. This ring-shaped element surrounds a chamber 28, which has been connected with the user's side of the valve house, by means of channels 29. Within the chamber 28 a ring-shaped piston 30 has been provided, which can move freely within the room 28, but which extends through inner parts of the valve housing 1.

The operation of the second embodiment is such, that when the valve 13 has been moved towards the supply side 3 by the water pressure, the valve body 13 presses against a sealing rim 31 of resilient material, so that the flow of liquid is being locked off and the piston 30 is being moved by the pressure of the valve body 13 such as to empty the chambers 28 by the piston 30 in which the liquid present in the chambers 28 are being disposed are through the channels 29 towards the user's side of the valve body. As a consequence of this action, the movement of the valve body 13 is decelerated. This results in the same effect as in the first embodiment.

Claims

1. One-way-valve comprising a valve seat fixed in a tubular body and a movable valve body, **characterized by** a chamber connected with the supply side of the valve through at least one throttle channel, of which the volume is reduced when the valve travels over at least a part of the path towards the valve seat.

2. One-way-valve according to claim 1, **characterized in** that said chamber has been incorporated into the valve seat.

3. One-way-valve according to claim 1, **characterized in** that the chamber has been incorporated into the valve body.

4. One-way-valve according to claim 3, **characterized in** that the valve body comprises two parts separated by said chamber, wherein said chamber is surrounded by a deformable ring-shaped member.

5. One-way-valve according to claim 4, **characterized in** that said deformable ring-shaped member also serves as a seal for the valve.

6. One-way-valve according to one of the preceding claims, **characterized in** that said valve body comprises guiding means for guiding it in the valve in the axial direction.

7. One-way-valve according to claim 6, **characterized in** that the guiding means take the shape of a pin fixed to said valve body and extending through a fixed cilinder.

8. One-way-valve according to claim 7, **characterized in** that said cilinder has been fixed into the cilinder by means of a snap lock.

9. One-way-valve to one of the claims 4-8, **characterized in** that both parts of the valve body have been mutually connected through a snap lock.

FIG.1

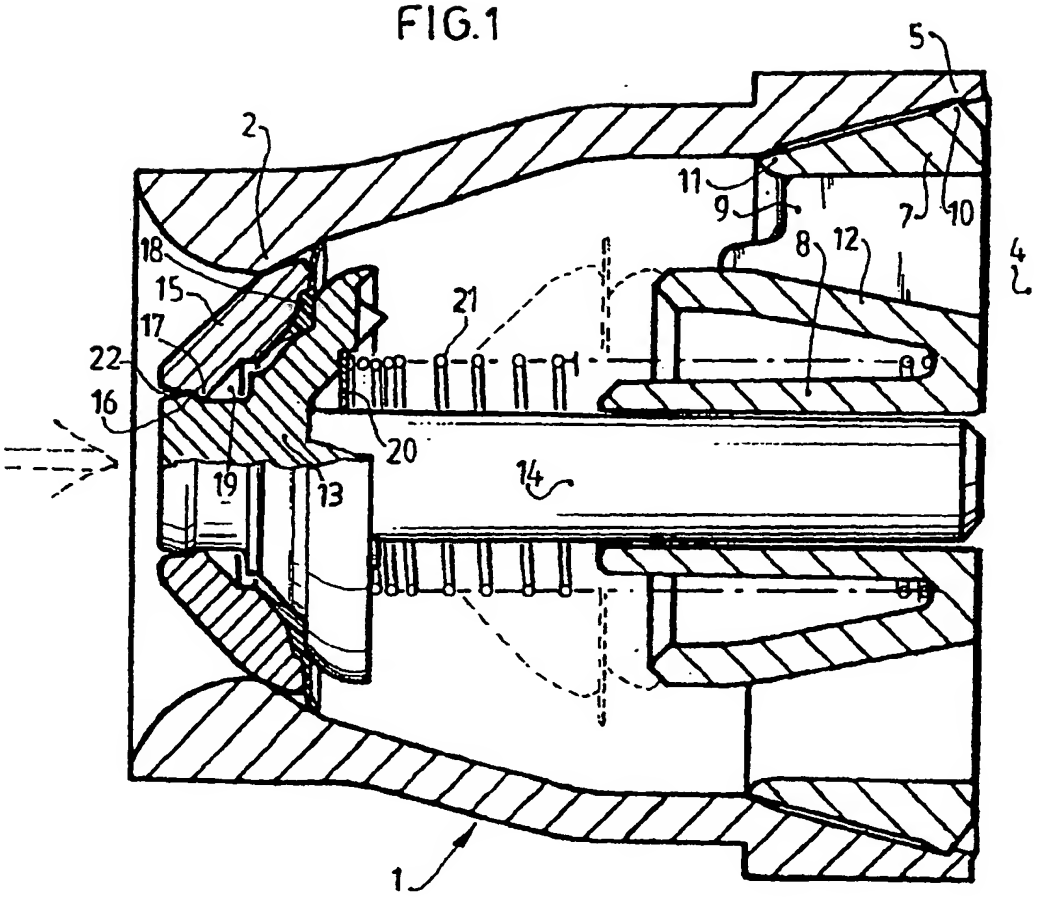

FIG. 2

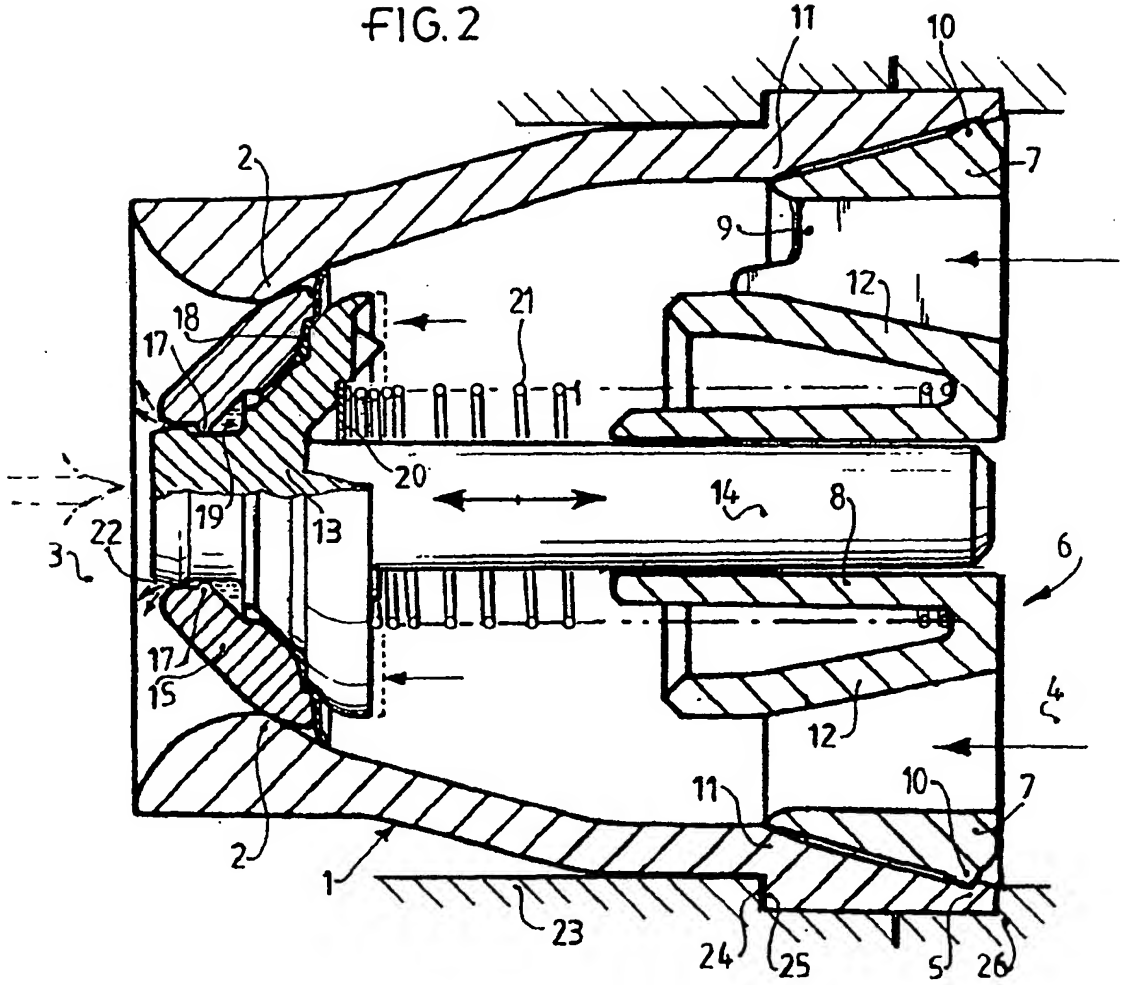
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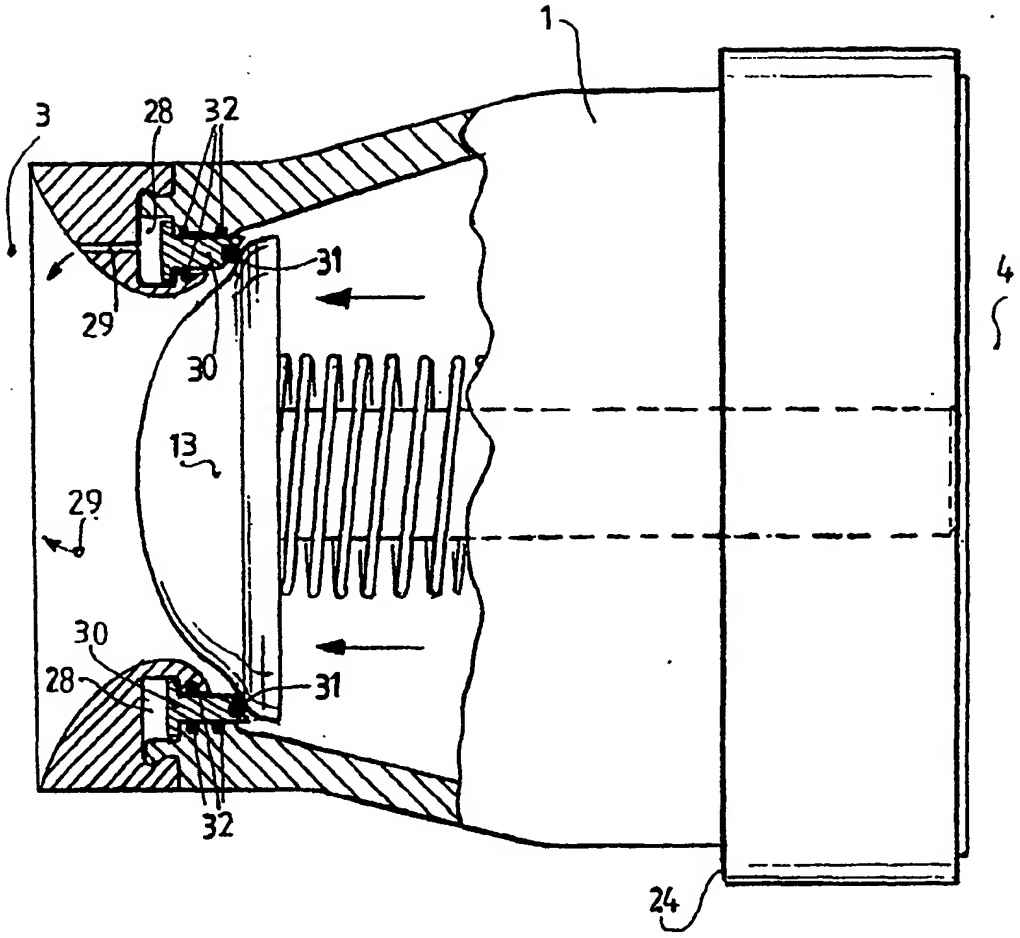
FIG. 3



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EUROPEAN SEARCH REPORT

Application Number

EP 88 20 2553

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
X	US-A-4 693 270 (YAINDL) * Column 4, line 6 - column 6, line 67 * ---	1,3,6,7	F 16 K 47/00 F 16 K 15/06
X	GB-A- 618 104 (FINNEY) * Page 2, lines 3-53 * ---	1,2,6	
A	FR-A-2 285 560 (BRAUKMANN) * Page 4, lines 10-23 * -----	1,6,7,8	
			TECHNICAL FIELDS SEARCHED (Int. Cl.4) F 16 K

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	06-02-1989	VERELST P.E.J.

CATEGORY OF CITED DOCUMENTS

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